

Using a Camera

Advantages and Disadvantages	76
Inventions Suited for Photography	76
Photographs Must Show Invention Clearly	77
Equipment	77
Taking Pictures	77
Choice of Background	77
Artificial Lighting	77
Flash	77
Sunlight	79
Maximize Object Size	79
Zoom In to Reduce Distortion and Preserve Focus	79
Depth of Field	79
Use a Tripod	79
Take Many Pictures	79
Paper Size	81
Summary	81

The PTO does not usually accept photographs because they are difficult and expensive to reproduce. However, if an invention cannot be adequately illustrated with black line drawings, black-and-white photographs may be used to illustrate inventions such as cell cultures, histological tissue cross sections, photomicrographs of material details, and animals. Color photographs may be accepted if they are necessary to properly illustrate the invention or design.

No petition is necessary to submit black-and-white photos. If you use color photos, they must be of sufficient quality to enable all the details to be clearly reproducible in black and white in the printed patent and a petition and a petition fee must accompany any color drawings. (See Chapter 8 for details on such petitions.) Keep in mind that color photos are approved only on rare occasions. If your petition is not granted, formal black line drawings must be submitted to replace the color photos when the application is allowed. (See Chapter 7.)

Although the rules severely restrict the submission of photographs, photos are still very useful as the basis for tracing with a computer software drawing or CAD program. This chapter provides instructions on how to take suitable pictures.

Advantages and Disadvantages

Included in the advantages of photography are that little artistic skill is required, a relatively short time is needed to take a picture, and subtle or certain complex images can be illustrated much better than with line drawings.

The disadvantages include the need for the novice to acquire a new set of skills, the difficulty of photographing very small objects clearly, and the difficulty or impossibility of photographing internal parts without cutting up an invention.

Another significant disadvantage is that when the photographs are eventually published in a patent, they reproduce very poorly on copiers and computer printers—to a degree that much of the detail will become illegible. Succeeding generations of reproductions—that is, copies of copies—will become progressively worse. Finally, still another disadvantage is the difficulty of manually adding figure numbers, reference numbers, and lead lines onto the photographs.

Inventions Suited for Photography

Photographs or photomicrographs are acceptable as formal drawings in a utility application if they are used to show fine and irregular or natural structures that are not capable of being illustrated with black line drawings—for example, electrophoresis gels, blots, autoradiographs, cell cultures, histological tissue cross sections, animals, plants, in vivo imaging, thin-layer chromatography plates, metallurgical microstructures, textiles, and crystalline structures. Of course, photography cannot be used for illustrating nontangible inventions and graphical representations, such as schematic diagrams, charts, and so on. In design applications, acceptable photographs include those that show subtle ornamental effects.

Photographs Must Show Invention Clearly

It is vital that the photographs from which line drawings are to be made as well as those which are used to illustrate microscopic details or subtle effects show all the important parts of the invention clearly, without any ambiguity. This is easy to accomplish for very simple inventions or inventions with large parts, but difficult to accomplish for complicated inventions or inventions with tiny parts.

Equipment

Whether you use photographs as patent drawings or for tracing, they must clearly show all the essential details. The minimum equipment necessary for taking clear pictures includes the following:

- a camera with an optical zoom lens. Digital cameras can take many images without your having to develop prints and transfer them directly into a computer for tracing. (They are superior to film cameras for photographing inventions.) The recommended minimum resolution is 5 megapixels. An optical zoom lens is a must. Avoid cameras with only digital zoom, as well as mobile phone cameras. A 35 mm film camera with a zoom lens can also be used, but a scanner is necessary for transferring the prints into a computer. However, a film camera is not recommended for black-and-white photos because of the scarcity of black-and-white film and the developing services that handle them.
- a tripod for stabilizing the camera for taking sharp pictures, and
- a good inkjet printer and photo-quality inkjet paper for making great photographic prints.

Taking Pictures

Although artistic photography is a complicated undertaking, patent photography is not, because its only goal is clear, sharp pictures. Aside from reading the manual of your camera, you can take good patent pictures by following the simple rules and tips discussed in this section.

Choice of Background

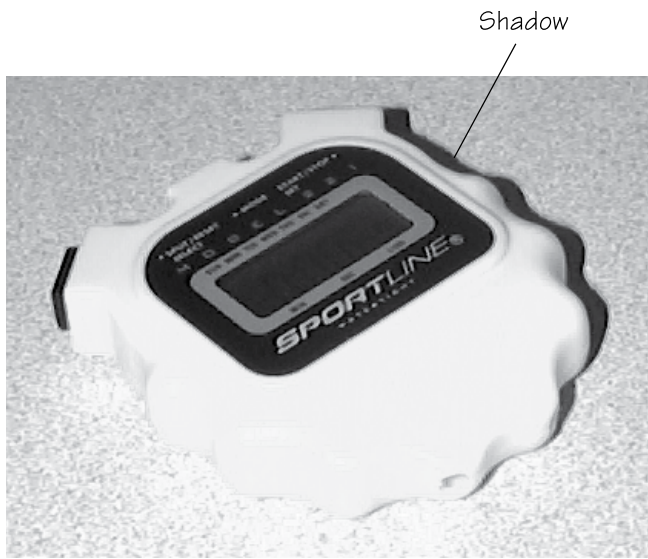
A high contrast background should be used. For example, if the object you want to photograph is light colored, the background should be dark colored, and vice versa. The background should also be uniform in appearance and of a solid color, such as a bare tabletop or a large piece of cardboard, so that there will be no confusion as to what is the background and what is part of the object.

Artificial Lighting

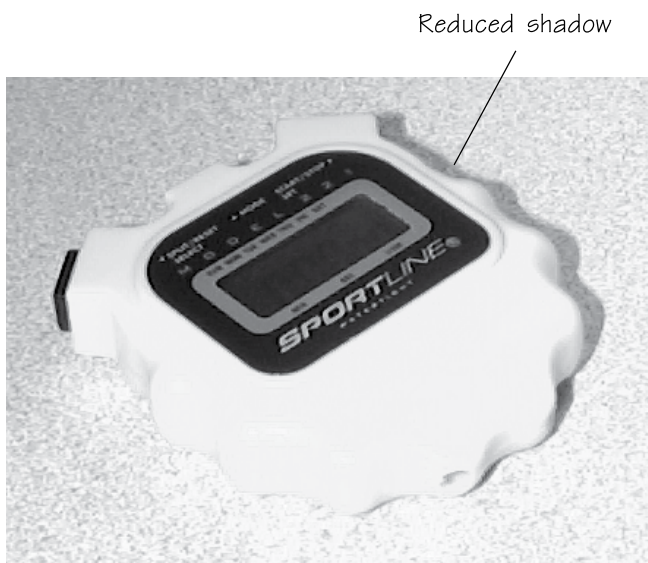
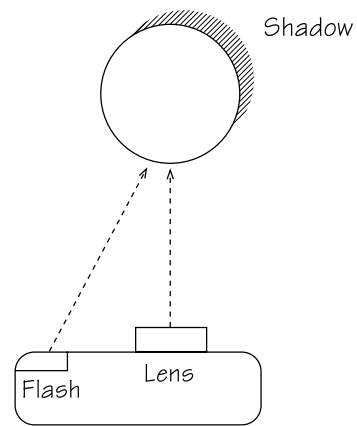
Always shoot (take pictures) in a brightly lit area. If necessary, illuminate the object with two lamps positioned around it, so that all of its details are clearly visible and to avoid dark shadows. Position the lamps to avoid glare reflecting off the object. Objects of dark colors should be lit with very bright lights to make them more visible.

Flash

Most snapshot cameras will usually flash when shooting indoors, unless the room is very brightly lit. The flash will create shadows if the object is positioned very close to the camera (due to the different lines of sight between the lens and the flash to the object). If the camera flashes, position a lamp, or slave flash unit, or a backlighting umbrella, very close to the side of the object opposite the flash to reduce the shadow, as shown in Illustration 4.1.



Shadow Without Supplemental Lighting



Reduced Shadow With Supplemental Lighting

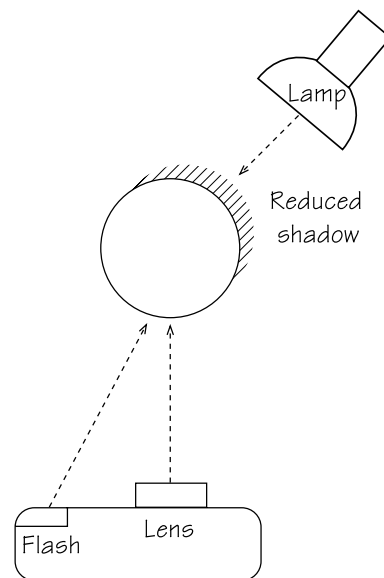


Illustration 4.1—Shadow Reduction With Supplemental Lighting

Sunlight

Avoid putting the object in direct sunlight, which will cast dark shadows that obscure details, as shown in Illustration 4.2. If direct sunlight cannot be avoided, position yourself between the object and the sun, so that you will photograph the side of the object that is most evenly lit. Also position the object to minimize shadows. If at any time there are dark shadows on the object, use the flash to reduce them. Most snapshot cameras have a Day Flash setting that makes the camera flash even in bright light.

Maximize Object Size

Make the object fill the viewfinder frame—that is, make it appear as large as possible—so that all of its details are as clear as possible. This is particularly important when there are small details. See Illustration 4.3. If an object or a detail is very small, you must use a zoom of high enough power or a macro lens to make it appear large enough.

Zoom In to Reduce Distortion and Preserve Focus

If you are not using a zoom lens, any object that you photograph close-up will appear distorted, as shown in Illustration 4.4. For this reason, we recommend using a zoom lens. Use the maximum zoom and stand far enough away from the object so that the object fills the frame. This will substantially reduce the distortion, as shown in the second half of Illustration 4.4. The distance from camera to object depends upon the size of the object; the larger the object, the farther away you must stand.

Zooming in is essential when photographing a small object. Without a zoom, you must stand so close to the object that most cameras will not focus. (The normal minimum focus distance is between 1.5 to 3 feet.) Many cameras have focus indicators in the viewfinders that typically

flash when the camera cannot focus on the object. Many cameras have a macro setting (extreme close-up) that allows you to take pictures at less than the normal focus distance.

Depth of Field

If you use a camera with manually adjustable aperture (F-number or F-stop) and exposure (shutter speed), set the aperture to F-16 or higher to make both the front and back of the object in focus—that is, to increase the “depth of field.” Set the exposure or shutter speed control on “A” (automatic). Keep in mind that the higher the F-number, the longer the exposure, and the steadier the camera must be to take sharp pictures. Therefore, a tripod is a must. The use of a high F-number is necessary, particularly when the shooting distance is small relative to the size of the object. For example, when shooting a telephone from just 60 cm (2 feet) away, or shooting a car from 2 meters (6 feet) away, the aperture should be set to a high F-number. Snapshot cameras typically have fully automatic aperture and exposure that are not user adjustable.

Use a Tripod

To ensure sharp pictures, use a tripod to steady the camera, and press the button slowly (or use a cable shutter release or remote control) so as not to move or jar the camera.

Take Many Pictures

Photography requires guesswork. Therefore, take pictures from different sides, angles, and under different lighting conditions to increase the likelihood of obtaining usable images. Keep track of the settings for each shot, so the best settings may be used again, if necessary. Remember—the resulting drawings must show every feature of the invention recited in the claims.



Dark Shadows

Bright sun without flash



Reduced Shadows

Bright sun with flash

Illustration 4.2—Shadow Reduction in Bright Sun



DON'T make the object appear
small in the frame.



DO make the object fill the frame.

Illustration 4.3—Maximize Object Size in Frame

**Distorted**

Photographed up close without zooming in

**Not Distorted**

Photographed farther away and zoomed in

Illustration 4.4—Zooming in to Reduce Distortion

Digital cameras have LCD color monitors for instant review of captured images. If an image is not good enough, you can take another picture immediately with a different setting or lighting condition. Take many pictures and choose the best after transferring the images to the computer.

Paper Size

If permitted, photographs submitted as patent drawings must meet the same paper size and margin requirements as line drawings. (See Chapter 8 for paper, margin, and other formal requirements.) Computer printouts of digital photographic images should be made on regulation letter or A4 size paper with borders that meet the margin requirements. The images should be properly positioned on the paper prior to printing. Some CAD programs, particularly *DesignCAD*, can also print images and even line drawings overlaid on images. Images from film must be developed on photographic

paper that meets the size requirements of line drawings. These photographs must also be printed with white borders that meet the same margin requirements as line drawings.

Summary

The PTO will accept photographs as patent drawings in rare situations only. Black-and-white photos can be used for patent drawings where fine detail must be illustrated and color photos or drawings can be used if color is an essential feature of an invention, but a petition and a fee are required for color submissions. However, regardless of whether you can submit them as patent drawings, photographs are useful as a source for tracing line drawings. The resulting drawings will usually be much better than those done from scratch. It's best to use a digital camera to take photos for tracing, and for the actual patent drawings, when photos are permitted. ●

